USER-FRIENDLY GUIDE TO THE SEIKO DS-250 DIGITAL SYNTHESIZED KEYBOARD

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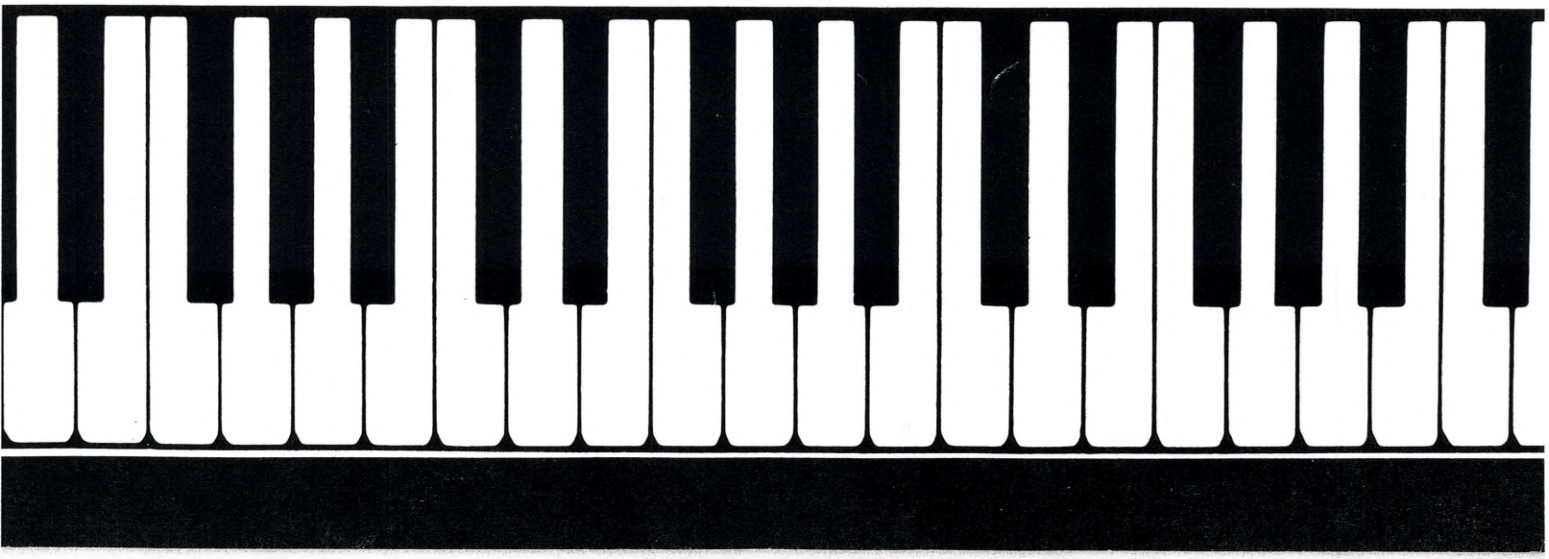


SEIKO DS-250

INTRODUCTION

The Seiko **DS250** Digital Synthesized Keyboard is one of the most advanced and versatile electronic keyboards available to todays MIDI minded musician. The **DS250** creates a vast array of different sounds utilizing two completely independent 8-note polyphonic digital sound generators, based on the harmonics addition and wave drawing generation method. Each sound source is comprised of up to three waveforms which can be divided into separate envelope stages: attack, sustain, and release. These three stages may be overlapped successively to create harmonic motion or "sound animation" for each key that is played. A total of six different waveforms are possible from these 2 sound sources, giving the **DS250** a level of sophistication previously only available on large scale systems.

In addition, each of the dual sound generators is independently accessible through the MIDI interface. This creates the effect of a built-in "sound expander module", allowing the single keyboard to act as two completely independent 8-note polyphonic instruments!

THE MANY USES OF THE SEIKO DS250

- **Performance**

Because of the dual digital sound generators, and careful selection of the 16 preset sounds, the **DS250** is an excellent instrument for the performing musician as a "utility keyboard." All the popular "standard sounds" are available at the touch of a finger.

- **Practice**

The **DS250** is equipped with an on board monitor system that allows the musician to practice just about anywhere, without the addition of expensive amplification systems.

- **Computer**

Both the Centronix interface and the MIDI interface allow the computer based synthesist unlimited potential for programming.

- **MIDI System**

Because each sound generator is independently accessible through MIDI, the **DS250** can act as two keyboards. One sound can be controlled by an external MIDI sequencer, while a second sound may be played simultaneously, using the entire **DS250** keyboard.

DS250 FEATURES

- Two entirely seperate 8-note polyphonic sound sources which may be controlled from both the keyboard and MIDI.
- Sixteen digitally created tone presets (expandable to 32 presets with optional ROM cartridge SRC Series).
- Detune – Allows 2 sound sources to be relatively detuned in cents and intervals.
- Key transpose – Entire keyboard may be transposed ± 1 octave in 12 keys.
- Sixteen-note polyphonic key split – three designated split points with independent ± octave shifts for the 2 sounds.
- Sound Mix – Sounds may be layered and effected seperately for greater tonal variety and richer texture.
- Accomodation of a DS310 Synthesizer option for user sound programming.
- Stereo (L.R.) Monaural, Sound 1 and Sound 2 audio output jacks for performance flexibility.
- Built in stereo speakers and headphone jacks for personal listening convenience.
- MIDI jacks IN/THRU/OUT with independent channel assignments for dual sounds.
- Centronics Standard Interface – DS250 may be connected to a personal computer for programming.

ACCESSORIES

AC adapter: Specifications depend on destination (allowable range of input voltage: ±10%)
Music score stand

Options

- Digital Synthesizer: DS-310
- ROM Cartridge holder: RCH-1
- ROM Cartridge: SRC series
- Keyboard stand: SKS-5
- Sustain pedal: SSP-1
- Expression pedal: SEP-1
- Soft case for DS-250: SKS-2
- Soft case for DS-310: SKS-3

For trouble-free performance, observe the following precautions:

- **AVOID**: Extreme heat and direct sunlight; dank or dusty places; heavy vibration or shock.
- **ONLY USE** AC adapter provided into AC 110-120V outlet
- **TURN OFF** power switch before connection
- **NEVER** use benzine, thinner, or other petroleum base solvents for cleaning keyboard cabinet. Use a soft dry cloth.

TECHNICAL SPECIFICATIONS

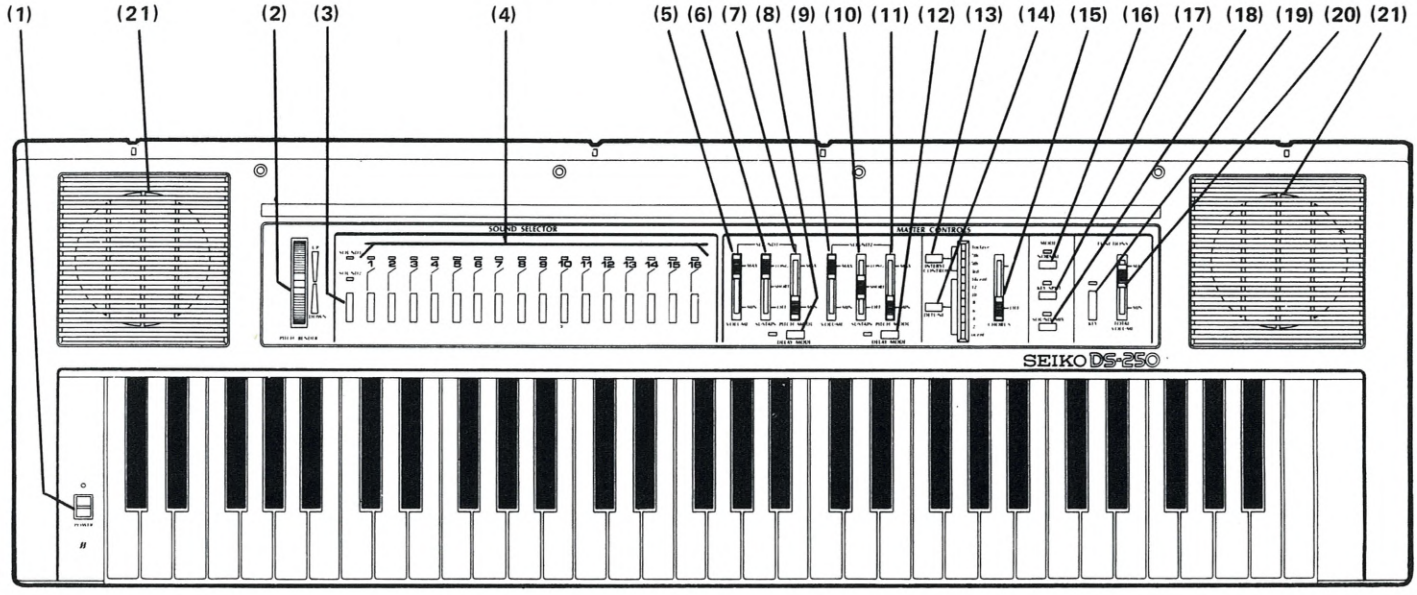
Power output
6W (3W x 2)
Power
DC 13.8V (through AC adapter)
Power consumption
12W (max.)
Monitor speakers
10cm x 2
Right side panel
Stereo out: 0.4V RMS 1KΩ
Mono out: 0.4V RMS 1KΩ
Headphone jack: Stereo, 3V RMS 47Ω
Pitch control: ±100 cents (±halftone)
Left side panel
S1, S2 out: 0.4V RMS 1KΩ
MIDI I/O: IN/THRU/OUT
MIDI channel setting: S1,S2: Set on channels 1–16
Rear Panel
Synthesizer jack (34 pin)
Centronics standard interface: 20 pin, 8-bit parallel
Cabinet
ABS plastic
Dimensions
967(W) x 100(H) x 316.5(D) mm
Weight
7kg – 15 lbs. 6 oz.

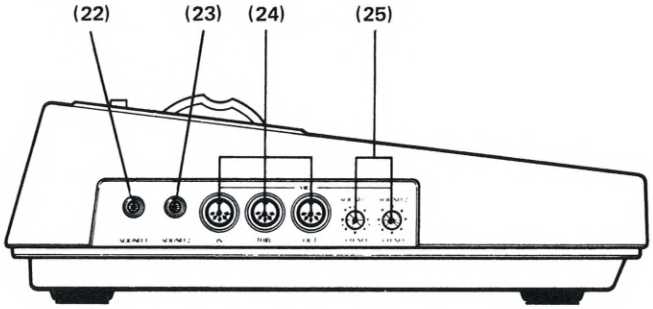
DIGITAL SYNTHESIZED KEYBOARD

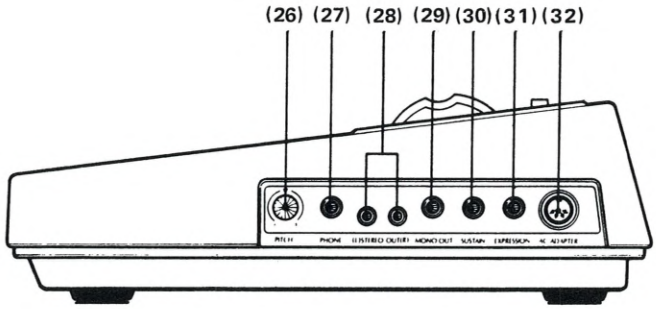
FUNCTIONAL LAYOUT

FRONT PANEL:

(1) **Main Power** switch
(2) **Pitch-Bender**
(3) **Sound 1/Sound 2** selector
(4) **Tone Preset Selectors**
(5) **Sound 1 Volume**
(6) **Sound 1 Sustain** switch
(7) **Sound 1 Pitch Modulation** switch
(8) **Sound 1 Pitch Mod. Delay** switch
(9) **Sound 2 Volume**
(10) **Sound 2 Sustain** switch
(11) **Sound 2 Pitch Modulation** switch
(12) **Sound 2 Pitch Mod. Delay** switch
(13) **Interval Control** switch
(14) **Detune** switch
(15) **Chorus** selector
(16) **Normal Mode** switch
(17) **Key Split Mode** switch
(18) **Sound Mix Mode** switch
(19) **Key Transpose** switch
(20) **Total Volume**
(21) **Speaker**







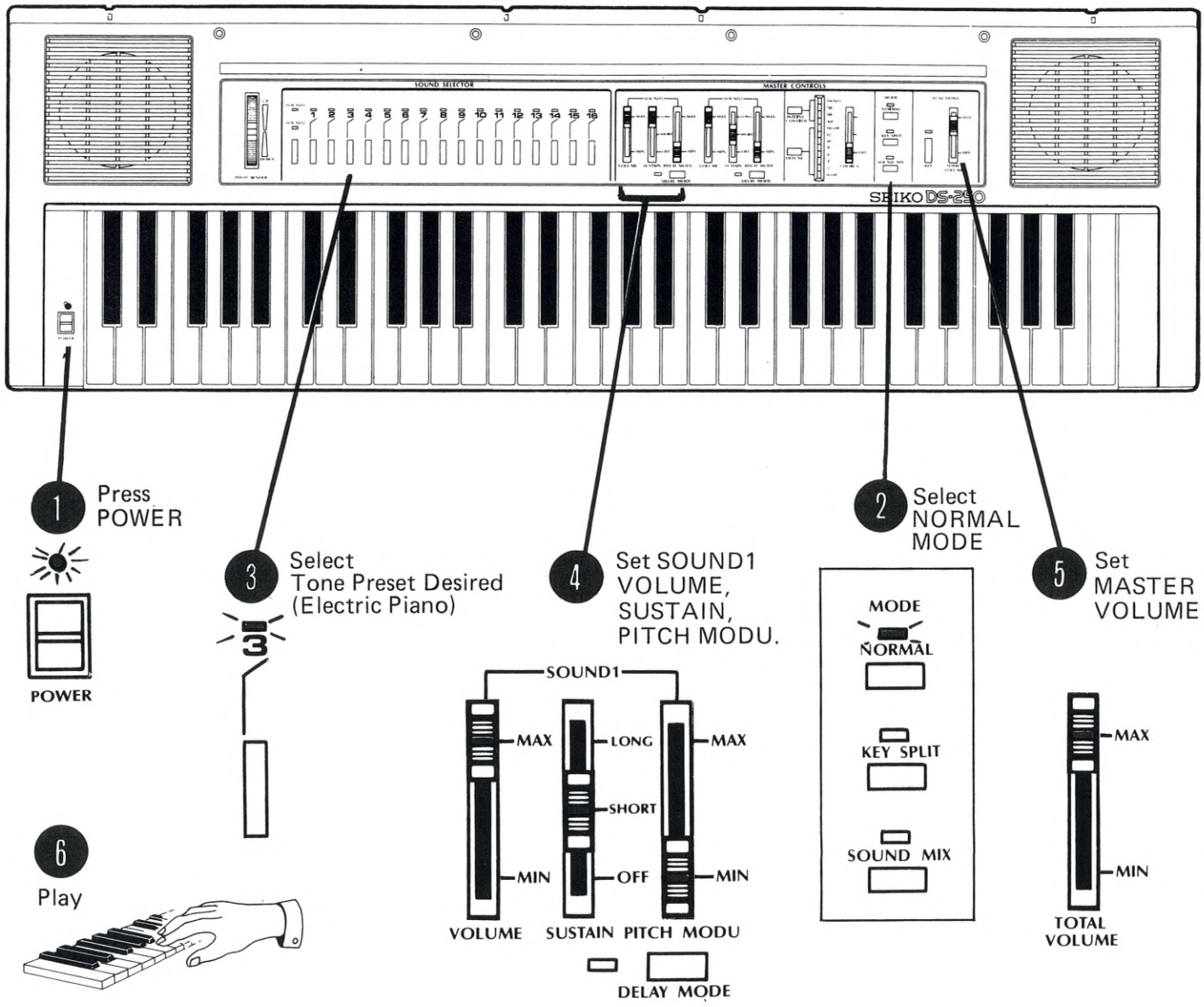
LEFT SIDE PANEL

(22) **SOUND 1 Out** ¼" jack
(23) **SOUND 2 Out** ¼" jack
(24) **MIDI** jacks (IN, THRU, OUT)
(25) **MIDI** channel switches (SOUNDS 1 & 2)

RIGHT SIDE PANEL

(26) **Pitch** adjustment knob
(27) **Stereo Headphone** ¼" jack
(28) **Stereo Out** RCA jacks
(29) **Monaural Out** ¼" jack
(30) **Sustain** pedal jack
(31) **Expression** pedal jack
(32) **AC Adaptor** jack

NORMAL MODE



ADVANCED HINTS

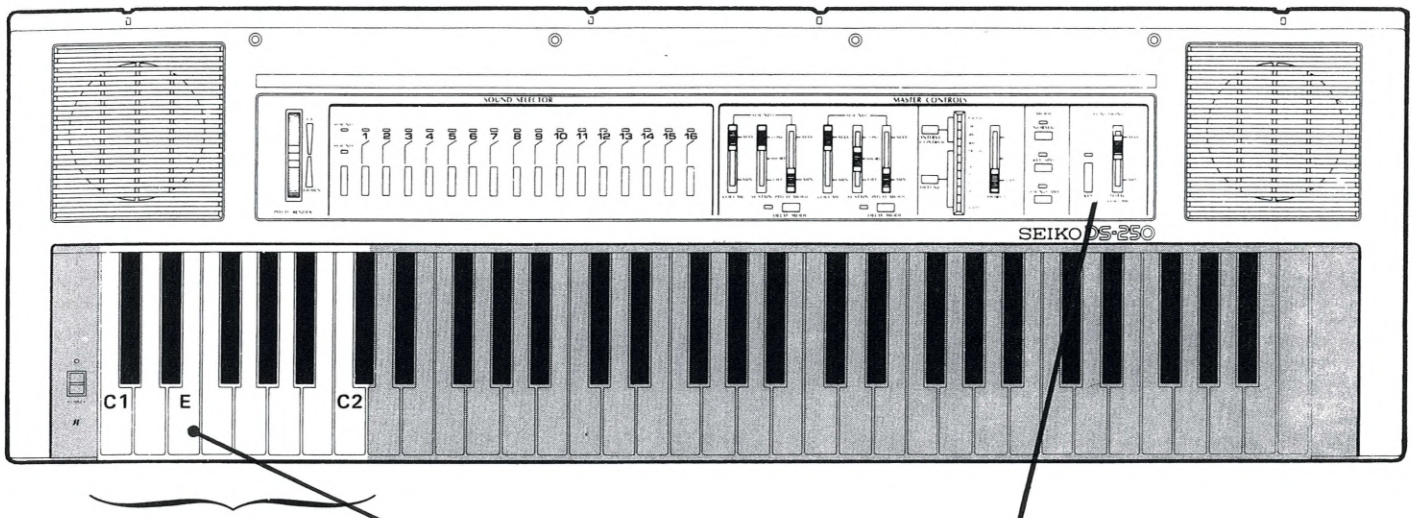
- **Adjusting the pitch**: You can fine tune the pitch of the keyboard using the pitch control, located on the right side.
- **Headphone**: Pluggging headphones into the headphone jack allows for private listening, because the speakers are automatically shut off when headphones are in use.
- **Line Out**: The keyboard can be connected to an amplifier using the "mono out". It is sometimes useful to plug in a dummy headphone jack when amplifying the keyboard in order to reduce microphonic sound.
- **Stereo Out**: The keyboard can be amplified through a stereo system by using the stereo line outs.
- **Remote Control**: Foot controlled volume and sustain pedals are available, and are connected on the right panel.
- SOUND 2 controls will have no effect in Normal Mode
- Preset sounds in normal mode are created from 2 sound sources:

  SOUND 1 (primary)
  SOUND 2 (slave)
- The slave sound can be detuned from the primary sound although there may be no noticable effect on some presets (see effects section)
- Sustain & Pitch Modulation are programmed into the preset sounds but may be readjusted by simply repositioning the panel switches for Sound 1.

16 PRESETS:

1. Piano 1
2. Piano 2
3. Electric Piano
4. Space Piano
5. Harpsichord
6. Digital Clavinet
7. Pipe Organ
8. Jazz Organ 1
9. Jazz Organ 2
10. Vibraphone
11. Flute
12. Clarinet
13. Brass 1
14. Brass 2
15. Strings
16. Bass Guitar

KEY TRANSPOSE



The entire keyboard transpose procedure can *only* be accomplished by holding down the keys from the lowest octave on the keyboard.

1 To shift entire keyboard up to the key of "E", **hold down** "E" key in lowest octave of keyboard.

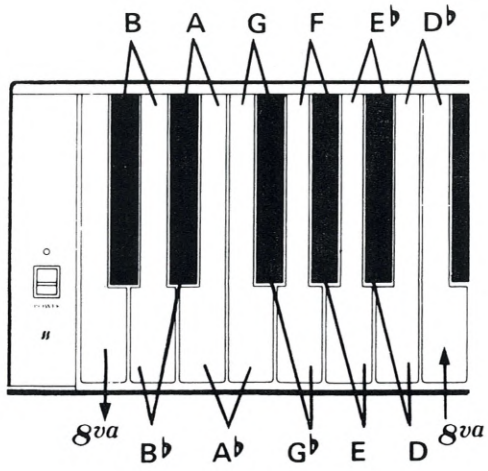
2 Push TRANSPOSE while holding down E key, LED will light up.

3 The entire keyboard is raised so that playing in the key of "C" will sound in the key of "E".

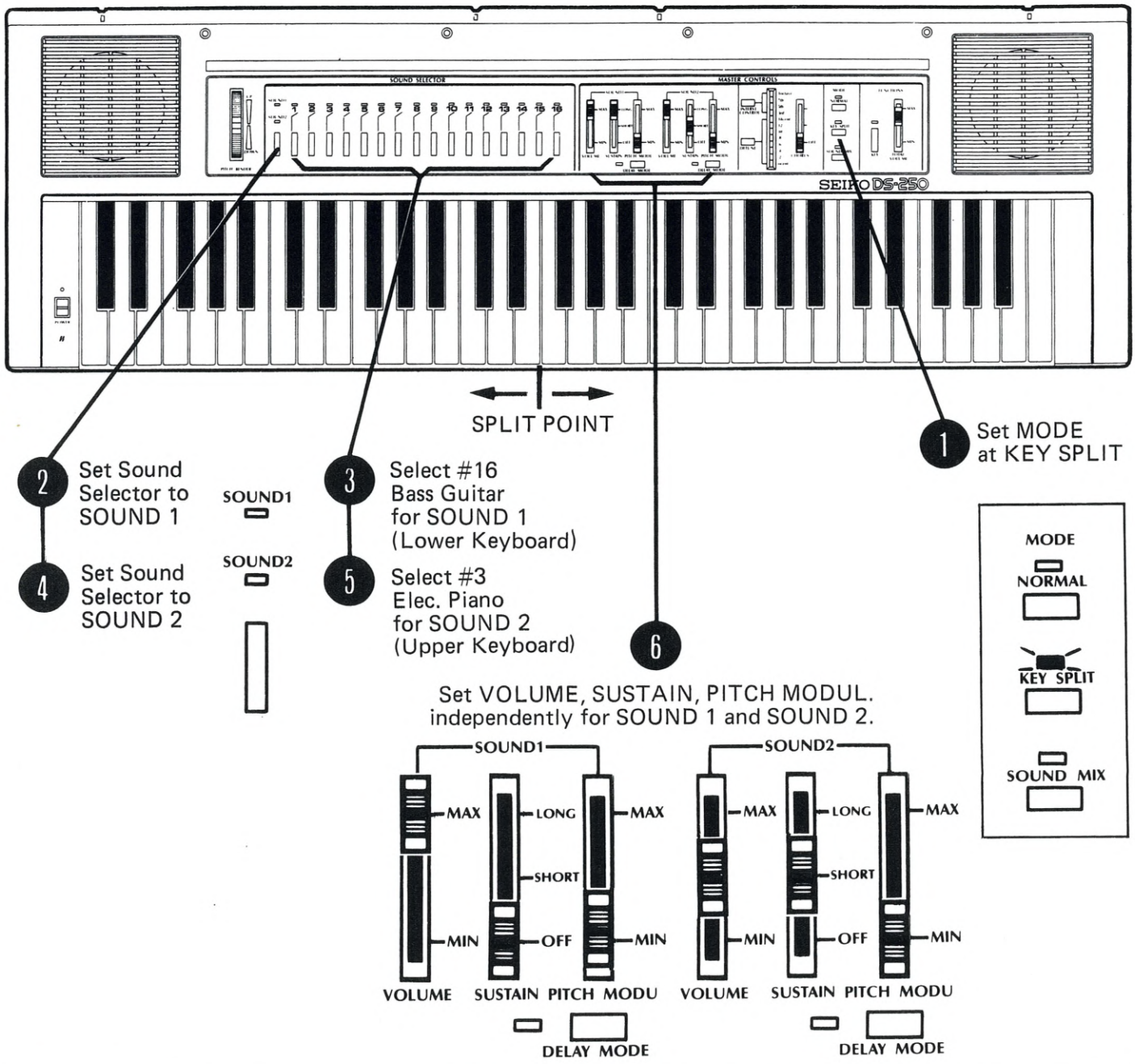
Push TRANSPOSE again to return keyboard to its original position. Try transposing into other keys by using the same procedure.

ADVANCED HINTS

- Transpose entire keyboard DOWN – 8^{va}
Hold C1 key during transpose procedure
- Transpose entire keyboard UP – 8^{va}
Hold C2 key during transpose procedure
- Transpose DOWN in other keys –
hold down the following 2 key combinations during transpose procedure



KEY SPLIT MODE



ADVANCED HINTS

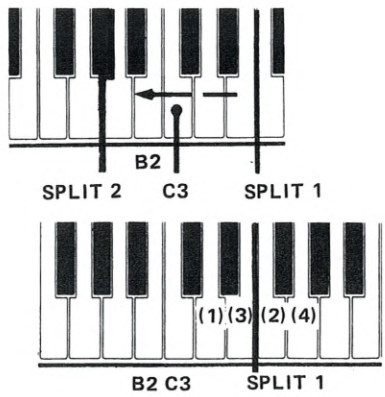
- **Moving the split point:** Holding down the **C3** key while depressing the Key Split switch will cause the split point to be shifted down to **A 2.**
- **Adjusting the octaves of split keyboard:** Holding down the following keys or combination of keys adjusts the octave of each sound independently.

(1) lower sound drops an octave

(2) upper sound drops an octave

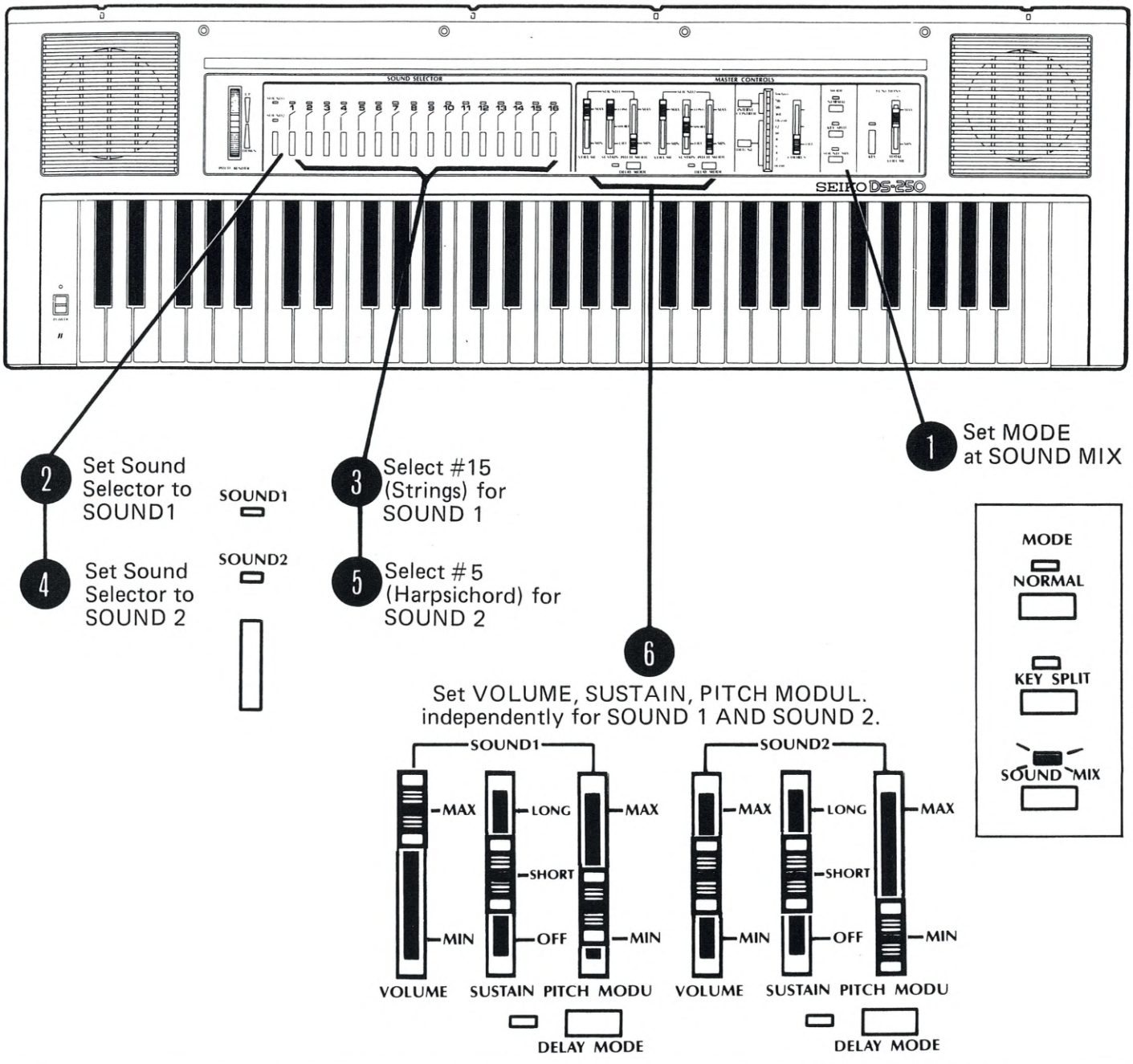
(3) lower sound raises an octave

(4) upper sound raises an octave



- **Moving the split point and transposition of each sound** can be accomplished by simultaneously combining the above procedures.
- **Moving the split point off the keyboard:** Holding down the B2 key while depressing the Key Split switch will cause the split point to be shifted off the keyboard. Then SOUND 2 may be played on the entire keyboard while SOUND 1 is being played by MIDI equipment.
- **When keyboard is returned to NORMAL MODE** SOUND 2 becomes SOUND 1.

SOUND MIX MODE



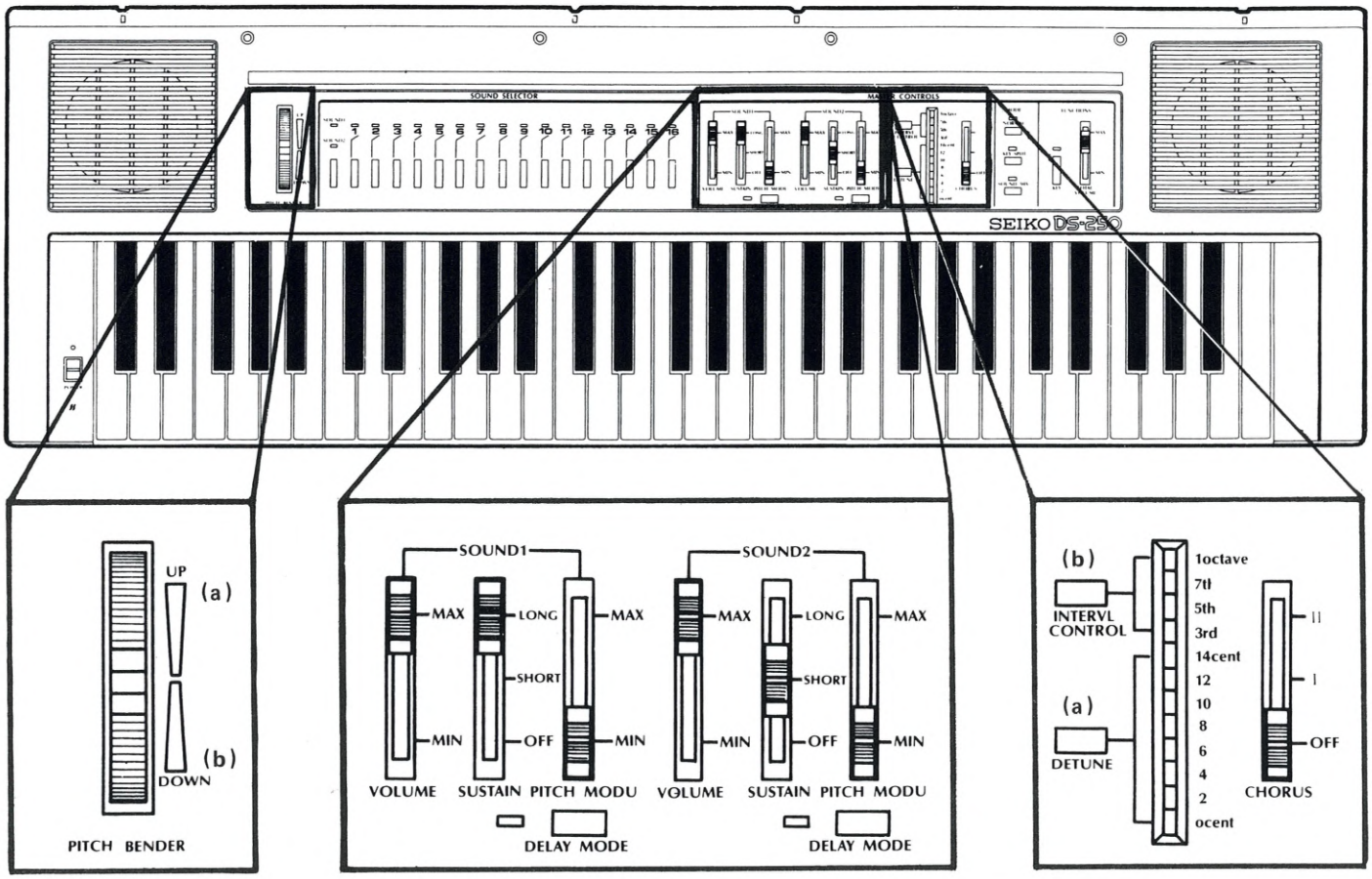
ADVANCED HINTS

- **Mixing a sound with itself** will result in a richer, fuller sound when detune is used
- **Sustain and Pitch Modulation** may be set separately for SOUND 1 and SOUND 2
- **When keyboard is returned to NORMAL MODE** SOUND 2 becomes SOUND 1

TRY MIXING THESE SOUNDS:

SOUND 1	SOUND 2
#16 Bass Guitar	#6 Digital Clavinet
#10 Vibraphone	#11 Flute
#1 Piano 1	#15 Strings
#6 Digital Clavinet	#15 Strings
#2 Piano 2	#14 Brass 2
#13 Brass 1	#6 Digital Clavinet
#15 Strings	#13 Brass 1
#1 Piano1	#10 Vibraphone
#1 Piano 1	#3 Electric Piano
#15 Strings	#12 Clarinet

SPECIAL EFFECTS



• **PITCH BENDER**: (a) Rolling the pitch bender upwards will continuously shift the pitch of the entire keyboard up (b) Rolling the pitch bender downward (towards the keys) will continuously lower the pitch of the keyboard.

• **SUSTAIN**: SOUND 1 & 2 are controlled independently with short or long sustain. Sustain pedal may be connected for ON/OFF control provided short or long position is selected on either or both sounds.

• **PITCH MODU.** Increases vibrato depth and frequency from min. to max. in 8 steps. DELAY MODE: when pressed indicator will light up and the start of the PITCH MODULATION will be delayed.

• **DETUNE**: The **DS250** has the unique feature of being able to detune one 8-note polyphonic sound relative to the other, either by cents and by 3rds, 5ths, 7ths or octaves.
(1) Pushing switch (a) will raise the pitch of SOUND 2 by the cents deviation indicated by the green LEDS. The detune will return to zero if the switch is pushed with detune at 14 cents.
(2) SOUND 2 can be tuned up by intervals relative to SOUND 1 by pushing switch (b).

Pressing the detune and interval control simultaneously will reset both functions to zero.

• **CHORUS**: The **DS250** has 2 fixed levels of chorus built in. The stereo chorus effects the entire keyboard, independent of selected mode or transposition.

Chorus effect is not present in SOUND 1 & SOUND 2 outputs from left side panel.

KEYBOARD SETUPS

Summarized below are several keyboard setups that provide the player with particularly useful sounds and applications. While this list is by no means exhaustive, it does demonstrate the versatility of the **DS250's** Sound Mix and Key Split modes for the performing musician.

NORMAL MODE

- **Brass Harmony**

1. Select Preset #13 – Brass 1
2. Detune interval to fifth
3. Play Brass in fifths

- **Clavinet Harmony**

1. Select preset #6, Digital Clavinet
2. Detune interval to third
3. Play Clavinet in thirds

KEY SPLIT MODE

- **Flute Lead/Vibraphone Accompaniment**

1. Key Split mode while holding E key left on split 1
2. SOUND 1 – preset #10 (vibraphone), use short sustain
3. SOUND 2 – preset #11 (flute)

Left side is vibraphone +1 octave

Right side is flute at normal octave

- **Strings Lead/Piano Accompaniment**

1. Key Split Mode
2. SOUND 1 – preset #1 Piano 1, short sustain/ no pitch modulation
3. SOUND 2 – preset #15, Strings/short sustain/ pitch modulation #2
4. Chorus I

- **Jazz Organ Lead/Bass Guitar Accompaniment**

1. Keysplit mode – hold down C key to shift to Split 2
2. Hold C1 and push key transpose to lower entire keyboard 1 octave
3. SOUND #1 – preset #16, Full volume/no sustain/ no pitch modulation

   SOUND #2 – preset #9, ½ volume/no sustain/ no pitch modulation – use Chorus 2

- **Electric Piano Lead/Bass Guitar Accompaniment**

1. Same as Jazz Organ/Bass
2. But for SOUND 2 use preset #2 (Piano 2), or preset #3 (Electric Piano) with short sustain
3. Use Chorus 2

SOUND MIX MODE

- **Piano & Vibes**

1. SOUND MIX – Chorus I
2. SOUND 1 – preset #1 Piano, full volume/short sustain/no pitch modulation

   SOUND 2 – preset #10 Vibraphone, ½ volume/ short sustain
3. Experiment detuning cents and intervals

- **Coupled Harpsichord** – key transpose 1 octave;

1. SOUND 1 – preset #6 Harpsichord, full volume/ short sustain/no pitch modulation

   SOUND 2 – preset #5, ½ volume/short sustain/ no pitch modulation
2. Detune 4 cents, and octave interval, Chorus 1

- **Harpsichord and Strings**

1. Same as Coupled Harpsichord except select preset #15 Strings, for SOUND 1 and use Chorus 2

- **Strings and Strings**

1. Same as Harpsichord and Strings, except select preset #15 Strings, for SOUND 2
2. Detune 6 cents, 0 interval
3. Add a small amount of pitch modulation to SOUND 1

- **Electric 12-String Guitar**

1. Sound Mix
2. Transpose entire keyboard DOWN 1 octave
3. SOUND 1 – preset #16 Bass Guitar, short sustain/ no pitch modu.
4. SOUND 2 – preset #6 Digital Clavinet, short sustain/no pitch modu.
5. Detune – 6 cents, interval: Octave
6. Chorus 2

Note: Try using different effects and Detune Interval settings to achieve interesting and useful sounds. Experiment with other tone presets and tone memories from the **DS310** Synthesizer module.

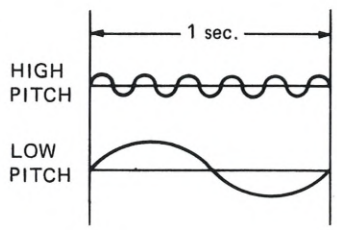
SYNTHESIZING

HARMONIC SPECTRUM

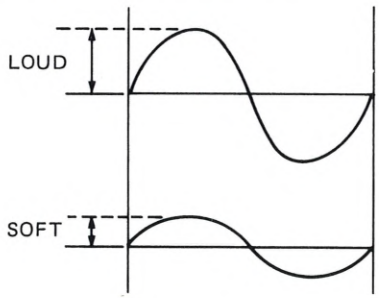
Sound is a vibration of air which we cannot see directly. If we convert it to an electrical signal, we can view these "vibrations" as "waves" on an oscilloscope or some other such instrument.

A sound has three main components:

1. PITCH (Frequency): A high-pitched sound has more wave cycles than a low-pitched sound. The frequency is the number of cycles per second called Hertz (Hz).

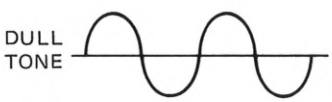


2. VOLUME (Amplitude): The loudness or intensity of a sound is determined by the height of the wave.



3. TIMBRE (Waveform): Timbre is the tonal color of a sound and is determined by the shape of a wave called the waveform. A "Sine" wave has a dull tone quality like that of a tuning fork. A "Sawtooth" wave has a sharper tone like that of a violin. The "Timbre" is what differentiates the sound quality of musical instruments.

SAWTOOTH



SINE WAVE

THE HARMONIC OVERTONE SERIES

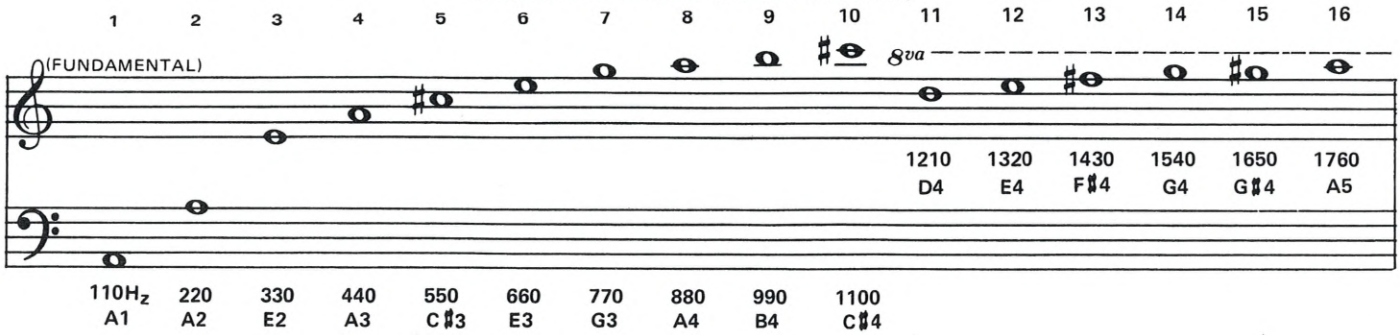
The overtone series, a naturally occurring physical principle, is a scale of notes whose pitches are multiples (2 times, 3 times, 4 times, etc.) of the fundamental frequency. If the fundamental frequency is 110 H_z, its overtones would be 110 x 2, 110 x 3, 110 x 4 . . . or 220, 330, and 440 H_z respectively (see chart of harmonics).

Any complex waveform can be expressed as the sum of a series of simple sine waves. A square wave, which resembles the sound of a clarinet, can be produced by taking the fundamental simple sine wave at 100% volume and adding the 3rd (33% volume), 5th (20% volume), 7th (14% volume), 9th (11% volume, and 11th (9% volume) harmonics.

The Seiko Digital keyboard system uses this "overtone content" theory to generate sounds. A desired sound is analyzed to determine which harmonics overtones are present and their relative intensities to each other. The keyboard is then programmed to reproduce the "sound spectrum" by individually generating sine waves of these overtone frequencies and then adding together the correct amount of harmonics overtones that will produce the desired sound.

Shown below in both musical notation and keyboard position are the notes (keys) corresponding to the 16 harmonic overtone series with a fundamental frequency of A110Hz.

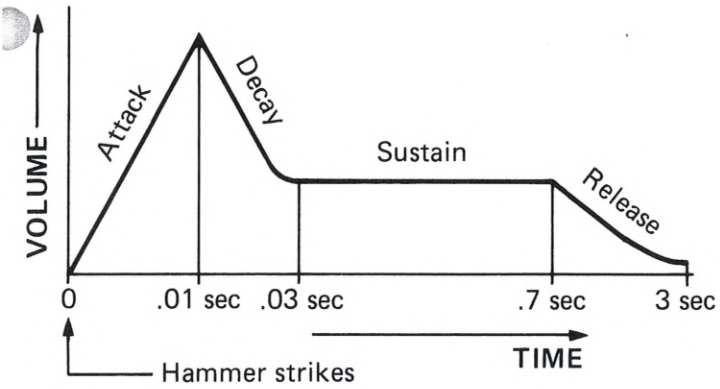
OVERTONE SERIES (16 HARMONICS)



THE ENVELOPE

In order to truly understand sound synthesis, there is another concept to understand, the *envelope*.

If you were to tape record a piano striking a note, and then play it back at a *very slow* speed, you would hear that the volume of the piano sound changes rather dramatically during the few fractions of a second after the hammer strikes the string. In fact, if you made a graph of the volume of the piano sound as a function of time, you would find that the volume looked like this



What this graph shows is that at the instant the hammer strikes the string there is no sound at all. However, .01 seconds after the hammer hits, the piano achieves its loudest volume. Between .01 seconds after hammer strike and .03 seconds after hammer strike, the volume then rapidly decays to a "flat" volume. The flat volume holds on from .03 seconds to .7 seconds after hammer strike. Then, starting .7 seconds after the hammer strike, the piano's sound begins to decay off to a very low volume. By 3 seconds after hammer strike, the sound of the piano has almost disappeared.

This change of volume with time is called the *"envelope"*. As you can see from our previous example, there are four separate events in an envelope

ATTACK	–	the rapid rise to maximum volume
DECAY	–	the rapid decline from maximum volume to a flat, constant volume
SUSTAIN	–	the part of the sound that stays the same volume for a fairly long period of time
RELEASE	–	the very end of a sound, when it is decaying down to zero volume

The *attack, decay, sustain,* and *release* of the piano sound are shown above.

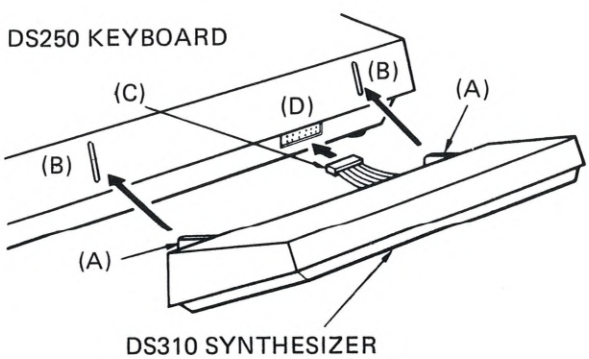
Because everyone likes to use initials instead of words, be alert to someone referring to the *"ADSR"* of the envelope . . . now you know what they are talking about!

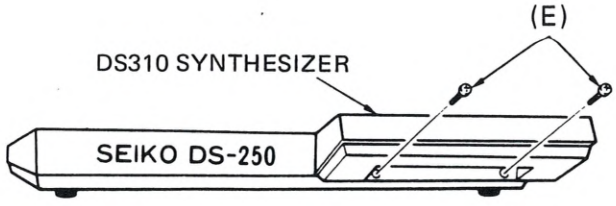
CONNECTING THE SEIKO DS310 SYNTHESIZER

1. **IMPORTANT**. Make sure the keyboard's power switch is in the OFF position when connecting the DS310 synthesizer.
2. Connect the synthesizer to the left backside of the keyboard by inserting hooks (A) into slots (B).
3. Carefully insert the cable plug (C) into the socket (D).
4. Use the enclosed screw fasteners (E) to securely anchor the DS310 to your keyboard.

Your DS310 has a battery-powered memory. Two "AA" batteries are located under a slide panel on the rear. They have an expected life span of about two years. Replace them with the long-lasting akaline variety.

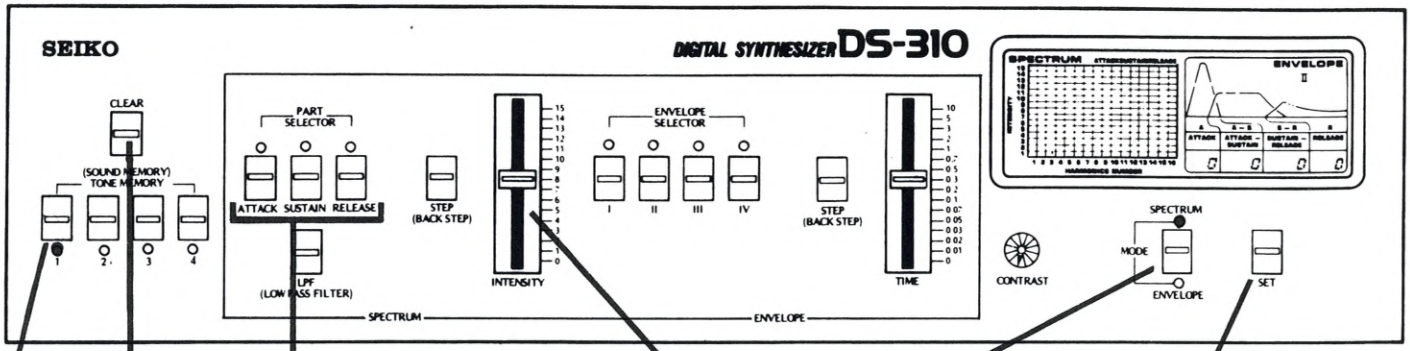
When changing batteries, keep the keyboard power switch ON to retain any data stored in the DS310 memory.





PROGRAMMING THE DS310 SYNTHESIZER

THE SPECTRUM



1 Push #1. TONE MEMORY

2 Push CLEAR

3 Select SPECTRUM mode

4 Program SPECTRUM by setting PART SELECTOR to ATTACK (Spectrum data you enter is recorded in the LCD):

- A Set FIRST harmonic INTENSITY by sliding lever to 15, then push SET
- B Set SECOND harmonic INTENSITY by sliding lever to 10, then push SET
- C Set THIRD harmonic INTENSITY by sliding lever to 3, then push SET

5 Set PART SELECTOR to SUSTAIN:

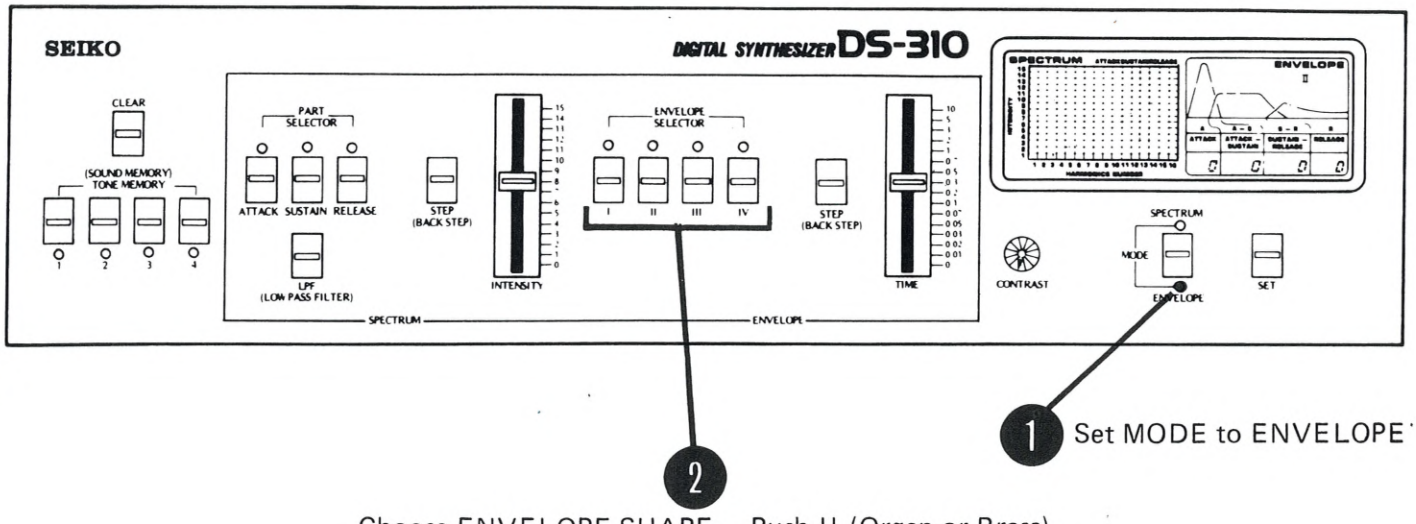
- A Slide intensity lever to 0, then push SET
- B Slide intensity lever to 10, then push SET
- C Slide intensity lever to 5, then push SET

6 Set PART SELECTOR to RELEASE:

- A Slide intensity lever to 0, then push SET
- B Slide intensity lever to 1, then push SET
- C Slide intensity lever to 0, then push SET
- D Slide intensity lever to 1, then push SET
- E Slide intensity lever to 10, then push SET
- F Slide intensity lever to 8, then push SET

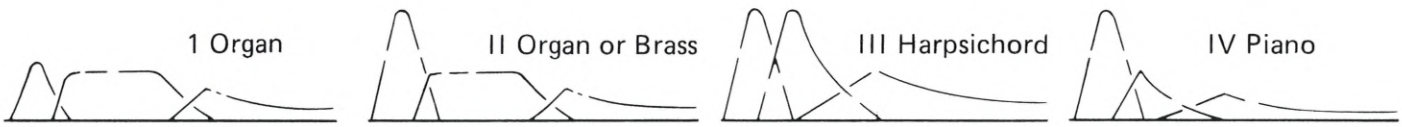
SPECTRUM PROGRAM IS COMPLETE, NOW PROGRAM THE ENVELOPE

THE ENVELOPE



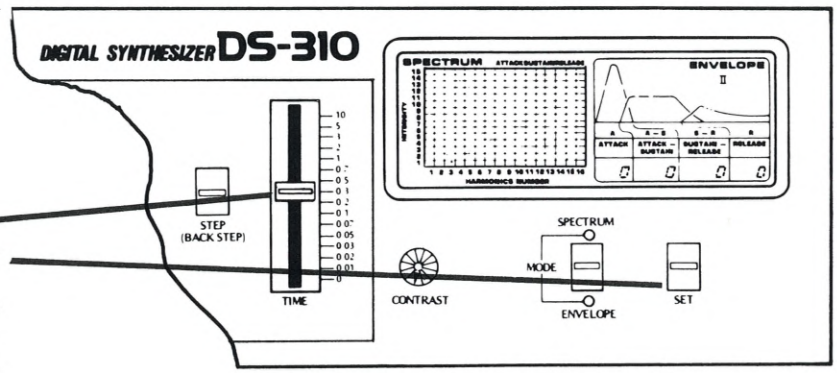
1 Set MODE to ENVELOPE

2 Choose ENVELOPE SHAPE – Push II (Organ or Brass)



3 Program TIME CONSTANTS – select how long the events in the ADSR will last (ADSR times you enter are recorded in the LCD):

A Set ATTACK time by sliding lever to .01 and then push SET
B Set DECAY time by sliding lever to .03 and then push SET
C Set SUSTAIN time by sliding lever to .05 and then push SET
D Set RELEASE time by sliding lever to .1 and then push SET



PROGRAM IS COMPLETE – The sound you've just created is now stored in Tone Memory #1

ADVANCED HINTS

- **COPYING**: In order to simply copy a spectrum from ATTACK to SUSTAIN, hold down ATTACK and push SUSTAIN. Similarly, you can copy from SUSTAIN to RELEASE.
- **LPF**: Pushing the LPF results in a filtering of the higher frequencies.
- **EDITING**: Use the STEP switch next to either the envelope or spectrum level to "back up" and correct the envelope time constant or spectrum intensity data. Push it as many times as necessary to move to the data that needs correcting. Note that to move forward again, data MUST BE RE-ENTERED
- The (back) step button is useful for quickly finding harmonic numbers to be adjusted.
- **CLEAR: CAUTION!** The clear switch while in envelope mode clears the entire program of the tone memory selected. The spectrum of one part may be cleared without clearing other parts or envelope data by pressing the clear button when in spectrum mode.
- A different harmonic spectrum may be programmed for the attack, sustain, and release parts of the envelope to achieve "sound animation" or movement of the harmonic overtones through time.

MIDI

Musical Instrument Digital Interface

MIDI is the standard system developed by electronic musical instrument manufacturers so their products can communicate with one another and with personal computers.

The **SEIKO DS250** MIDI is an advancement in state-of-the-art MIDI equipped keyboards.

MIDI IN/THRU/OUT jacks with DIN (5-pin plug) connections are provided on the left side panel.

MIDI IN – To Receive Data
MIDI THRU – To Relay Data
MIDI OUT – To Send Data

Although one set of MIDI jacks is used, the **DS250** is uniquely capable of sending and receiving two 8-note polyphonic keyboard parts by assigning separate MIDI channels (1-16) to each sound source.

MIDI CHANNEL SWITCHES – Two 16-position rotary switches are located next to the MIDI jacks.

Use these to select SOUND 1 and SOUND 2 MIDI channels individually (1-16). The rotary switches will set MIDI IN data only.

Start by setting SOUND 1 and 2 switches to channels 1 and 2 respectively for basic applications.

TO SEND DATA TO REMOTE MIDI EQUIPMENT (Keyboards, Sequencers, Drum Machines, Computers, etc.)

1) Connect a 5-pin MIDI cable to the MIDI OUT jack on the left side panel of the **DS250**.

2) Plug the other end of the cable into the MIDI IN jack of the remote MIDI equipment.

3) The **DS250** will send data only on channels 1 and 2 according to the following MODE settings:

NORMAL: All Data Sent On Channel 1

KEYSPLIT: SOUND 2 Data Sent On Channel 1
SOUND 1 Data Sent On Channel 2

SOUND MIX: SOUND 2 Data Sent On Channel 1
SOUND 1 Data Is Not Transmitted

TO RECEIVE DATA FROM REMOTE MIDI EQUIPMENT

1) Connect a 5 pin MIDI cable to the MIDI IN jack on the left side panel of the **DS250**.

2) Plug the other end of the cable into the MIDI OUT jack of the remote MIDI equipment (or MIDI thru jack as the case may be)

3) The **DS250** is ready to receive data OMNI OFF/POLY according to the following MODE SETTINGS

NORMAL – Data received depending upon SOUND 1 rotary switch channel selection (1-16)

KEY SPLIT – SOUND 1 data received depending upon SOUND 1 rotary switch channel selection (1-16)

SOUND 2 – Data received depending upon SOUND 2 rotary switch channel selection (1-16)

SOUND MIX – Data received depending upon SOUND 1 rotary switch channel selection (1-16)

To Receive Separate Channels In Sound Mix –
1) HOLD KEY TRANSPOSE, PUSH SOUND MIX
2) REPEAT PROCEDURE TO RESET

ADVANCED HINTS for receiving MIDI

PROGRAM CHANGE IGNORED – HOLD DOWN KEYSPLIT when switching power ON

PROGRAM AND CONTROL CHANGES IGNORED – Hold down SOUND MIX when switching power ON.

OMNI ON/POLY – To receive ALL MIDI channels together hold key transpose and push normal mode. Repeat procedure to RESET OMNI OFF/POLY

TRANSPOSITION AND KEY NUMBER
Normally the **DS250**:

A) sends – key numbers of pitches as they are transposed on the keyboard.

B) receives – pitches as they sound regardless of the transpose set-up on the keyboard.

HOLDING Key Transpose and pressing key split will:

A) send – played key number only
B) receive – so that pitches may be transposed via key transpose switch on the keyboard

Please refer to MIDI implementation chart for specific INPUT/OUTPUT information.

MIDI IMPLEMENTATION TABLE

Function ...		Transmitted	Recognized	Remarks
Basic	Default	1(UPPER) 2(LOWER)	1-16(UPPER) 1-16(LOWER)	UPPER...SOUND 2 LOWER...SOUND 1
Channel	Changed	X	O	
Mode	Default	3	3	
	Messages	X	OMNI ON/OFF	
	Altered			
Note Number : True voice		36-96 13-108	13-108 13-108	
Velocity	Note ON	X $90 V=64	O $90 V=0-127	
	Note OFF	X $90 V=0	X $90 V=0	
After Touch	Key's	X	X	
	Ch's	X	X	
Pitch Bender		X	X	
Control Change	1	O	O	PITCH MODULATION
	64	O	O	SUSTAIN
	80	O	O	CHORUS
	81	O	O	MODE
	82	O	O	INTERVAL
	83	O	O	DETUNE
Prog Change : True #		O 0-15&16 └DS-310	O 0-15&16 └DS-310	
System Exclusive		X	X	
System Common	: Song Pos	X	X	
	: Song Sel	X	X	
	: Tune	X	X	
System Real Time	: Clock	X	X	
	: Commands	X	X	
Aux	: Local ON/OFF	X	X	
	: All Notes OFF	X	O (122-127)	
Mes- sages	: Active Sense	X	X	
	: Reset	X	X	

Mode 1 : OMNI ON, POLY Mode 2 : OMNI ON, MONO O : Yes
Mode 3 : OMNI OFF, POLY Mode 4 : OMNI OFF, MONO x : No

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TOKYO, JAPAN

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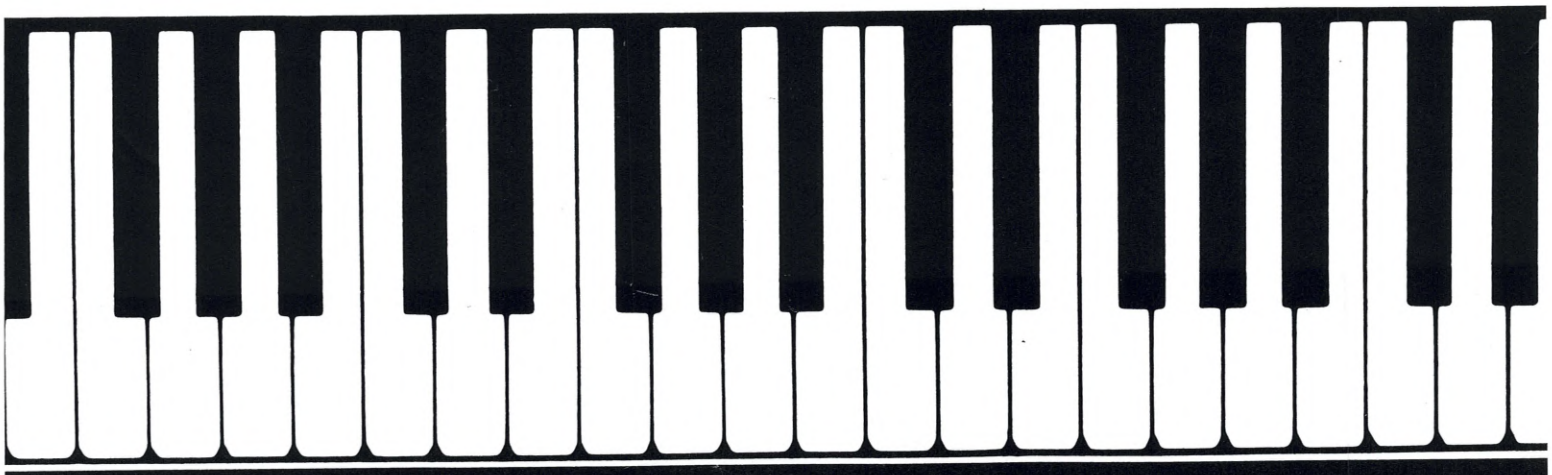

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